

Title: Glued to the Tube or Hooked to the Books?

Brief Overview:

Students will collect data on their study and TV viewing time over a determined period of time. Students will use a graphing calculator to find measures of central tendency, construct a box and whiskers graph, construct a scatter plot of class collected data, and examine a line of best fit. The students will use this information to complete worksheets and a performance based assessment.

Links to Standards:

- **Mathematics as Problem Solving**
Students will analyze a set of data and apply their knowledge of statistics to solve a real-world problem.
- **Mathematics as Communication**
Students will communicate in a letter a mathematical solution to a real-world problem.
- **Mathematics as Reasoning**
Students will construct a logical argument based on mathematics to support their solution to the extension questions and the assessment.
- **Mathematical Connections**
Students will use the connections between Algebra and Statistics.
- **Algebra**
Students will use tables and graphs as a tool to analyze data.
- **Functions**
Students will represent and analyze sets of data using tables, equations, and graphs.
- **Statistics**
Students will understand and apply measures of central tendency, variability, and correlation. Students will draw inferences based on data analysis.

Links to Maryland High School Mathematics Core Learning Goals

- **3.1:** The student will collect, organize, analyze, and present data
- **3.1.1:** The student will design and/or conduct an investigation that uses statistical methods to analyze data and communicate results.
- **3.1.2:** The student will use the measures of central tendency and variability to make informed conclusions.
- **3.2:** The student will apply the basic concepts of statistics and probability to predict possible outcomes of real-world situations.
- **3.2.1:** The student will make informed decisions and predictions based upon the results of simulations and data from research.
- **3.2.2:** The student will make predictions by finding and using a line of best fit and by using a given curve of best fit.

Grade/Level:

Grades 7-10

Prerequisite Knowledge:

Students should have working knowledge of the following skills:

- Computing and interpreting measures of central tendency
- Constructing and interpreting box and whiskers graphs and scatter plots
- Recognizing correlations between data
- Use of a TI-83 graphic calculator

Objectives:

Students will:

- collect a set of data.
- use a graphing calculator to organize and graph data.
- interpret a set of data.
- communicate findings in a letter.

Materials/Resources/Printed Materials:

- TI-83 calculators/ overhead projector
- Student data collection sheets
- Class data overhead transparency
- Student activity sheets

Development/Procedures:

- Students should be familiar with the basic concepts of statistics: central tendency, box and whiskers, and scatter plots.
- Students will receive a class data sheet, activity sheets, worksheets, and a TI-83 graphing calculator. A TI-82 calculator may be used with slight modifications to the activity sheet.
- Data should be collected for the week before this activity is to be used. On the first day of this activity, each individual student should fill in his or her data on the class data transparency.
- The teacher should lead the class through the activity sheet. It is suggested that students work in pairs or cooperative groups during this activity.
- Students will submit for a grade the activity sheets and the extension worksheet.
- At the end of the unit each student should individually complete the performance based assessment.

Performance Assessment:

The teacher should check the activity sheet and the extension questions for completion. We suggest that the assessment be graded using a holistic scoring rubric.

Extension/Follow Up:

- Have students collect and analyze other sets of data, using the processes practiced during this unit.
- Have students create posters or bulletin boards to display their work.

Authors:

Jill Holowaty
Urbana High School
Frederick County, MD

Dave Muse
Eastern High School
Washington, DC

Glued to the Tube or Hooked on the Books???

Data Collection Sheet

Name _____
Period _____

Directions: Every day this week, record the number of hours you spend studying and watching TV. Round your data to the nearest quarter hour.

Day of Week	Hours spent studying	Hours spent watching TV
Sunday		
Monday		
Tuesday		
Wednesday		
Thursday		
Totals		

Answer these questions at the end of the week:

1. The average (mean) # of hours a day I spent studying this week is _____ hours.
2. The average (mean) # of hours a day I spent watching TV this week is _____ hours.

(HINT: Divide the total number of hours in each category by the number of days during which you recorded data).

3. The median of my study hours data is: _____
4. The median of my TV hours data is: _____

(REMEMBER: The median is the “middle number.”)

Class Averages Overhead Template

[illegible]

Glued to the Tube or Hooked on the Books?: Class Data Analysis

We will use your graphing calculator to do the following: find measures of central tendency, construct a box and whiskers graph and scatter plot of our data, and investigate whether our data exhibits a linear relationship.

Instructions:

I. Entering the data.

To enter data in two lists, press these keys:

- Clear the lists in memory by pressing:

2nd MEM Select Option 4 ENTER

- Then enter the data by pressing:

STAT Select Option 1 ENTER

- Enter study hours data one number at a time under L1, pressing ENTER after each entry
- Use the right arrow to get to L2, and enter the TV hours data in the same fashion.

II. Finding measures of central tendency.

To find the sum, mean, median, extremes, and upper and lower quartile for each list:

- Get the statistics calculation menu by pressing:

STAT Select CALC (Right arrow)

- Calculate measures of central tendency by selecting option 1: 1-Var stats ENTER
- On the screen, after 1-Var Stats, type 2nd L1
- Use the data displayed on your screen to fill out the study hours column on the following table.
- Repeat the process above, but calculate measures of central tendency for L2 (TV hours) and fill out the TV hours column on the table.

	Study Hours	TV Hours
Sum (Σx)		
Mean (\bar{x})		
Median (med)		
Upper extreme (max X)		
Lower extreme (min X)		
Upper quartile (Q ₃)		
Lower quartile (Q ₁)		

III. Making a box and whiskers graph.

To make a box and whiskers graph, do as follows:

- Access Plot 1 under the Stat Plot menu by pressing:

2nd
Stat Plot
Select 1
Enter

- Highlight these commands by placing the blinking cursor over them and pressing ENTER

On 

- Xlist should be L1 for Study Hours, and Freq should be 1. Change them if you need to.

- Set your window dimensions by typing:

ZOOM
Select ZoomStat (9)
Enter

Draw a picture (as close to scale as possible) of the box and whiskers graph you get. Label:

1. Upper extreme
2. Lower extreme
3. Lower Quartile (LQ)
4. Upper Quartile (UQ)
5. Median

Use TRACE -> <- commands to find the values at each point.

*** Stop here and do questions 1-9 on Extension Sheet ***

III. Making a scatter plot

- Turn Plot 1 off under the Stat Plot menu
- Make a scatter plot of the class data by pressing

2nd Stat Plot Select Plot 2 Enter

- For Plot 2, highlight the following by placing the blinking cursor over

On 

- To put study hours on the x-axis, make L1 your x-list. To put study hours on the y-axis, make L2 your y-list
- Press GRAPH
- You can now TRACE from point to point.

*** Stop here and answer questions 10-11 on Extension Sheet ***

IV. Correlation

Your graphing calculator will investigate correlation between variables by finding a line of best fit. You can instruct the calculator to find a line of best fit as follows:

STAT Choose CALC Choose LinReg (ax + b) ENTER

Your calculator just found values for a line in the form $y = ax + b$

One of the values the calculator computed, the value **r**, tells you about how strong a correlation the data exhibit. If **r** is close to 1, the data show a strong positive correlation. If **r** is close to -1, the data show a strong negative correlation.

To draw the line of best fit on your graphing calculator, press:

Y= VARS Select Statistics (5) Select EQ
Select 1 (RegEQ) Graph

*** Stop here and answer questions 12-13 on Extension Sheet ***

Name
Period

Extension Sheet

Please answer the following questions when you are directed during the Analyze Data activity. Please be sure TO EXPLAIN your answers carefully.

1.
 - a. Do you fall above or below the mean for hours of TV watched per week?
 - b. Use our class average of weekly TV hours to calculate how many hours per **day**, on average, we watch TV.
 - c. How does your average **daily** TV watching time compare to the class average you just found?
 - d. Were you above or below the mean for both weekly hours (answer a) and daily hours (answer c)? Does this make sense?
2. Do you fall above or below the mean for study hours per week?
3. Does anyone in our class have exactly our average for hours of TV watched or study hours?
4. What do you think would happen to both means if we collected data from everyone in our school?
5. Suppose there was a power outage in town during data collection, causing every individual to average 2 less hours of TV watching time. What would happen to the class average for TV viewing time? Also, what do you think would happen to the class average for study hours?

6. Suppose that a new student, Brain E. Ack, joins our class. Brain, an extremely diligent student, averages 45 hours of study time every week. How would his study habits affect the class average for study hours?
7. Look at the box and whiskers graph. What is the range of the data?
8. Label a point X on your box and whiskers graph where you fall. Are you in the upper or lower half of the data? What quartile are you in?
9. Compared the other quartiles, how closely does your weekly study hours match others in your quartile. Consider the relative lengths of each quartile.
10. Looking at the data on your graph, do you see a relationship (correlation) between the two variables (study hours and TV hours)? Is there a negative relationship, positive relationship, or no clear relationship?
11. Explain in words the relationship you see. (EX: The more TV a person in class watches...)
12. Use the values your calculator found for **a** and **b** to write an equation of the line of best fit
 $y =$
13. Use your calculator and the best fit equation to estimate the following:

Sally watches 25 hours of TV each week. How many hours does she study?

Jose does not study at all. How many hours of TV does he watch?

Dominique studies for 30 hours a week. How many hours of TV does she watch?

Name
Period

TOO MUCH TV?

Your friend watches 19 hours of television during the week (Sunday-Thursday). The other evening, while she was watching her favorite show, her mother turned off the TV saying, “You watch too much TV!” Your friend has thought about it and can not figure out how her TV viewing habits compare to the average kid in your grade. She passes a note to you during math class explaining her confusion and asking you the question: “Do I watch too much TV?”

You realize that this is the perfect opportunity to use all of the statistics that you have been learning in class. Write a letter to your friend explaining how her TV viewing compares to that of your classmates. Use statistical data to support your claim. Include in your letter a box and whiskers graph of your classmates TV viewing data. You may construct this graph on your graphing calculator, but be sure to draw the graph to scale and label all parts. Indicate to your friend where she lies on the graph.

Be sure in your letter to do the following:

- Define the problem
- Recommend a solution to the problem
- Defend your solution with data, your graph, and reasoning
- Summarize your solution

Performance Checklist

Problem Defined _____

Solution Recommended _____

Correct Solution _____

Completed Graph _____

Graph Labeled _____

Accurate Graph _____

Data Supports Solution _____

Summarize Solution _____